19.5

**The University of Jordan**
**Mathematics Department**

**Principles of Statistics**
**Second Exam April 28, 2016**

**Name:** **Number:**

**Section:** **Instructor:**

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 | 16 | 17 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| **a** | / | / | / | | | | | | / | | | | / | | | | / |
| **b** | | | | | | | | / | | | / | | | | | / | |
| **c** | | | | / | / | | / | | | | | | | | | | / |
| **d** | | | | | / | | / | | | / | | | | / | | | |
| **e** | / | | | | | / | | | | | | / | | | / | | |

**Multiple Choice**
*Identify the choice that best completes the statement or answers the question.*

1. If $X = 0, 2$ is a discrete random variable with $E(X) = 0.4$, then $P(X = 0) =$
   a. 0.6 b. 0.7 c. 0.4 d. 0.5 e. 0.8

2. The grades of students are normally distributed with mean 70 and standard deviation 6, if a student is chosen randomly, the probabiltiy that the student's grade is more than 64.96 is
   a. 0.8 b. 0.6 c. 0.7 d. 0.2 e. 0.3

1. $E(x) = \sum x f(x) = 0 f(0) + 2(f(2)) = 0.4$

$f(2) = 0.2$

$\sum f(x) = 1 \longrightarrow f(0) + f(1) = 1$

$f(0) + 0.2 = 1$

$f(0) = 0.8$

2. $X \sim N(70, 36)$

$P(X > 64.96) = 1 - P(X \le 64.96)$

$Z = \frac{x - \mu}{6} = \frac{64.96 - 70}{6} = -0.84$

$P(Z > -0.84) = 1 - P(Z \le -0.84)$

$1 - 0.2005 = 0.7995$

3. The grades of students are normally distributed with mean 70 and standard deviation 6, if 5 students are chosen randomly, the probabiltiy that exactly 3 students with grades more than 64.96 is
   a. 0.205   b. 0.058   c. 0.351   d. 0.469   e. 0.263

4. If the probability of hitting a target for each single trial is 0.7, then the probability of hitting the target for the first time in the third trial is
   a. 0.7   b. 0.42   c. $\boxed{0.063}$   d. 0.21   e. 0.124

5. Given $X \sim Binomial(100, 0.3)$, using the normal approximation, $P(X < 30) =$
   a. 0.3299   b. 0.6002   c. 0.4562   d. 0.4022   e. 0.5201

3. $X \sim N(\overset{\mu}{70}, \overset{\sigma^2}{36}) \xrightarrow[n<30]{\text{approx.}}$
$n = 5$

$Y$ = The number of student get more than 64.96

$P(Y=3) = P(Y \le 4) - P(Y \le 3)$
$= 0.672 - 0.263 = 0.409$

$Y \sim B(5, 0.8)$

4. $P = 0.7$

$X \sim G(P) =$
$P(X=3) = p\,q^{3-1} = 0.7\,(0.3)^2$

5. $X \sim B(100, 0.3) \xRightarrow{\text{approx.}} N \sim (\overset{\mu}{30}, \overset{\sigma^2}{21})$

$P(X<30) = P(Z < 0.02)$ $= 0.4920$

$Z = \dfrac{29.5 - 30}{\frac{21}{10}} = -0.238$

29.5 ~~30.5~~

29 30 31

$\mu = 2$

$n \quad p \quad \sigma = 1.6$ $\quad P(2 < x < 6.8)$

6. If $X \sim Binomial(10, 0.2)$ then $P(\mu < X < \mu + 3\sigma) =$ $\quad P(2 < X \le 6) = P(3 \le X \le 6) = P(X \le 6) - P(X \le 2)$

a. 0.401 b. 0.477 c. 0.273 d. 0.221 e. 0.316 $\quad 0.999 - 0.678 = 0.321$

7. If $X \sim Geometric(1/3)$, $Y \sim Geometric(1/4)$, and $X$ and $Y$ are independent random variables, then $E(XY) =$

a. 1/135 b. 10 c. 1/12 d. 12 e. 0

8. In a store 30% of the computers are from supplier 1 and the rest are from supplier 2. 20% of the computers from supplier 1 are defective and 30% of the computers from supplier 2 are defective. A computer is chosen randomly from this store, the probability that it is defective is

a. 0.25 b. 0.27 c. 0.20 d. 0.22 e. 0.29

7.

$P_x = \frac{1}{3}$

$P_y = \frac{1}{4}$

$E(XY) = \sum xy\, f(x,y)$

$\sum xy\, f(x) f(y)$

$\frac{1}{3} \cdot \frac{1}{4} = \frac{1}{12}$

8. 30% $S_1$ $\rightarrow P(E_1) = 0.30$

70% $S_2$ $\quad P(E_2) = 0.70$

20% $S_1$ $\quad P(D|E_1) = 0.20$

30% $S_2$ $\quad P(D|E_2) = 0.30$

$P(D) = P(E_1) \cdot P(D|E_1) + P(E_2) P(D|E_2)$

$0.06 + 0.21 = 0.27$

9. In a store 30% of the computers are from supplier 1 and the rest are from supplier 2. 20% of the computers from supplier 1 are defective and 30% of the computers from supplier 2 are defective. A computer is selected randomly from this store and found to be defective, what is the probability that it is from supplier 2.

a. 0.7778 b. 0.6888 c. 0.8777 d. 0.5999 e. 0.6333

10. If the grades of students in a certain population are normally distributed with standard deviation 4, and 10% of the students are above the grade 70, then the mean of the grades is

a. 65.79 b. 62.16 c. 63.45 d. 64.88 e. 66.80

11. If $X$ and $Y$ are discrete random variables with $Var(X) = 9$, $Var(Y) = 4$, and $Cov(X, Y) = 3$, then $Var(2X - Y) =$

a. 18 b. 28 c. 8 d. 36 e. 14

9. $P(E_2 \mid D) = \dfrac{P(E_2 \cap D)}{P(D)} = \dfrac{P(E_2)\,P(D \mid E_2)}{0.27} = \dfrac{(0.7)(0.3)}{(0.27)} = 0.778$

10. $\delta = 4$

above the 70 = 0.10 P

$P(X > 70) = 0.10$

$\cancel{Z^* = \dfrac{x-\mu}{\delta}}$ $\cancel{\dfrac{70-\mu}{16} = 0.10}$ $\cancel{\mu = 69.4}$

$P(Z > Z^*) = 0.10$ $\cancel{1.28}$

$Z^* = \cancel{\dfrac{x-\mu}{\delta}}$ $\cancel{-1.28} = \dfrac{70-\mu}{4}$

$P(Z > Z^*) = 1 - P(Z > Z^*)$

$1 - 0.10$

1.28

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$\delta = 4$

$P(x > 70) = 0.10$

$P(Z > Z^*) = 0.10$

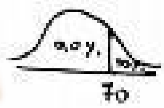
$1 - P(Z < Z^*) = 0.10$

$P(Z < Z^*) = 0.90$

$Z = \dfrac{x-\mu}{\delta}$

$1.28 = \dfrac{70-\mu}{4}$

$\mu = 64.88.$




11. $Var(X) = 9$ $Var(Y) = 4$ $Cov(X, Y) = 3$

$Var(2X - Y) = 4\,Var(X) + 1\,Var\,Y + (2)(2)(-1)(3)$

$36 + 4 + -12 = 28$

$4 = E(x^2) - 16$

$6^2 = E(x^2) - (E(x))^2$

$\frac{e^{-\mu}\mu^k}{k!} = \frac{e^{-\mu}\mu^0}{0!} = e^{-\mu} = e^{-4}$ $\mu = 4 = 6^2$

12. If $X \sim Poisson(\mu)$ with $P(X=0) = e^{-4}$, then $E(3X^2 - X + 7) =$ $3E(x^2) - E(x) + 7$

$3(20) - 4 + 7$

a. 56 b. 37 c. 13 d. 24 e. 63

13. Consider the following joint probability density function:

| Y / X | -2 | 0 | 1 |
|---|---|---|---|
| 1 | 0 | 0.3 | 0.4 |
| 2 | 0.1 | 0.2 | 0 |

$P(X+Y>1) =$ $f(1,1) + f(2,0) + f(2,1) = 0.6$

a. 0.6 b. 0.4 c. 0.8 d. 0.5 e. 0.7

14. Let $X$ and $Y$ be discrete random variables with $E(X) = 2$, $Var(Y) = 3$, $E(Y^2) = 19$, $E(Y) > 0$, and

$3 = 19 - \mu^2$ $\mu_y = 4$

$E(XY) = 5$. $Cov(X,Y) =$

a. -5 b. 6 c. -4 d. -3 e. 5

$cov(x,y) = E(xy) - \mu_x \mu_y$

$= 5 - (2)(4)$

$5 - 8 = -3$

15. The weights of students in a certain population have mean 50 kgs and standard deviation 5 kgs, if a random sample of size 36 is chosen, the probability that the sum of their weights is less than 1836 kgs is

a. 0.5793 b. 0.6677 c. 0.9590 d. 0.4033 e. 0.8849

16. If the grades of students are normally distributed with mean 65 and a random sample of size 16 is taken and showed a standard deviation 5, then the 95th percentile of the distribution of the sample mean is

a. 73.0021 b. 67.1913 c. 70.5680 d. 63.4430 e. 66.0112

17. A box contains 3 white balls, 2 black balls, and 5 red balls. If we draw randomly 15 balls with replacement, the probability of getting at least 4 white balls is

a. 0.485 b. 0.297 c. 0.703 d. 0.515 e. 0.655

15. $n = 36$

$\mu = 50$

$S = 5$

$x < 1836$

$P(x < 1836) = ?$

$P(\bar{X} < 51) =$ $\bar{X} \sim N(50, \frac{25}{36})$

على $\frac{X_i}{n} = \bar{X}$ ←

$Z = \frac{\bar{X} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{51-50}{\frac{5}{6}} = \frac{6}{5} = 1.2$

$P(Z < 1.2) =$

16. $\mu = 65$

$n = 16$

$S = 5$

$P_{95} = ?$

$P(Z < Z^*) = 0.95$

$Z^* = 1.65$

$Z^* = \frac{\bar{X} - \mu}{\frac{\sigma}{\sqrt{n}}} = \frac{\bar{X} - 65}{\frac{5}{4}} = 1.65$ $\bar{X} = 67.0625$

17. $\frac{3}{10}$ $N = 10$ $\boxed{\begin{matrix} 3 & 2 & 5 \\ W & B & R \end{matrix}}$ $n = 15$

$P(X \geq 4) =$ $X \sim B(15, 0.3) =$

$1 - 0.515 =$